LETTERS TO THE EDITOR.

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Average Number of Kinsfolk in each Degree.

As Dr. Galton has completely misunderstood the point of my last remark, I fear it will be necessary again to re-open a discussion which I had thought was satisfactorily closed.

My point is this: If we take a large number n of families containing in the aggregate nd sons and nd daughters, and remove on an average one child *of specified sex* from each family, we shall have a preponderance of the opposite sex in those that remain. The *average* numbers under this condition will be d and $d-1$, and not $d-\frac{1}{2}$ and $d-\frac{1}{2}$, and this was how I was originally led to my first conclusion.

If, however, we wish to test the question whether a girl has the same average number of brothers as sisters, we are only concerned with families containing at least one girl, and therefore families containing only boys must be left out of account, as I stated. When these have been removed there will be a preponderance of girls in the families that are left. It is this cause which enables us to reconcile the fact that, while the probable total numbers of girls and boys in any family may be equal, the probable numbers of brothers and sisters of a single individual of specified sex, say a girl, may still be equal. This may not be such a rigorous method as Dr. Galton employs, but it at least shows that the result is not necessarily opposed to what one would naturally infer from general considerations. G. H. BRYAN.

Compound Singularities of Curves.

THE compound singularities of algebraic curves may be divided into three *primary* species. First, *point singularities,* or multiple points, which are exclusively composed of nodes and cusps; secondly, *line singularities,* which are exclusively composed of double and stationary tangents; thirdly, *mixed singularities,* which are composed of a combination of simple point and line singularities. Amongst compound line singularities may be mentioned (α) a double tangent which osculates a curve at one of its points of contact, the constituents of which are one stationary and two *ordinary* double tangents; (β) a tangent having a contact of the fourth order with a curve, the constituents of which are three double and three stationary tangents.

The third species comprises the majority of compound singularities, and may be divided into the following subsidiary ones:—

(1) Nodes and multiple points, any tangent at which has a contact of a higher order than the first with its own branch, and does not touch the curve elsewhere. The flecnode and biflecnode are the most familiar examples of this species.

(2) Nodes, cusps, and multiple points, any tangent at which has a contact of the first or some higher order at some other point or points on the curve. For example, it is possible for each of the six nodal tangents of a trinodal quintic to touch the curve elsewhere, and it can be shown that the six points of contact lie on a conic.

(3) Two or more nodes, cusps or multiple points may have a common tangent. Thus the reciprocal of a biflecnode is a pair of cusps having a common cuspidal tangent, whilst a septimic curve may possess a node and a rhamphoid cusp having a common tangent.

(4) Singularities of the tacnode and oscnode type. When the number of constituent double points is unequal to $\frac{1}{2}n(n-1)$, where n is a positive integer, the singularity cannot be a multiple point, but must be of the tacnode type; and since the constituents of a tacnode are two nodes and two double tangents, every singularity of this species must contain double or stationary tangents, or both. When the number of double points is equal to $\frac{1}{2}n(n-1)$, the singularity *may* be a multiple point, but when it contains line as well as point singularities, it is of the same type as the oscnode, which is composed of three nodes and three double tangents.

(5) A tangent at a node or a multiple point, which has a contact of a higher order than the first with its own branch, may coincide with some other tangent at the singularity. When both tangents at a flecnode coincide, the resulting singularity is a tacnode; but the coincidence of two or more tangents at a multiple point, any of which possess this property, gives rise to a variety of peculiar singularities which do not appear to have been completely examined.

It is also possible for a mixed singularity to be formed in more than one manner; in other words, it may possess more than one penultimate form. Thus an oscnode may be formed by the union of two cusps and two stationary tangents, and additional singularities of this character are possessed by quintic and sextic curves.

To call a cissoid or a cardioid a *nodal* curve appears to me a glaring misuse of language, since both curves are *nodeless.* A. B. BASSET.

November 18.

The Origin of Life.

No doubt "Geologist" points out a literal flaw in my statement, but I thought it would be obvious that by the "potentiality of life," which would be destroyed by heat, I meant potentiality of life, appearing within the time of the experiment. Given countless ages, then, on the evolution hypothesis, the potentiality of life, as of the rest of nature as we know it, existed in the fluid mass of the uncooled earth, and I did not mean to say anything inconsistent with this. Nor, on the other hand, did I mean to say that by the heat applied the potentiality of life in the matter under test would be destroyed for all time. I meant potentiality of appearing within a given time, the time of the experiment, and I cannot help thinking this was the natural sense of my words.

In asking me to explain the introduction of life or its potentiality into this planet, "Geologist" shows that he has entirely mistaken the purport of my letter. My aim was only logical, not constructive. If I could explain how life first appeared on the earth, I should probably be able to suggest a more promising line of experiment than that hitherto followed, which I find myself unable to do. My sole object was to point out a logical error, as it seemed to me, in the view commonly taken by men of science of the results of these experiments, an error, if my memory serves me, fully shared by Huxley—in admiration for whom, I hasten to say, I yield to no one. Huxley, if I remember rightly, was so impressed with the strength of the evidence against the contemporary origination of life that he practically gave up the idea, and put the date back. In this, I am venturing to suggest, he was illogical; through having overlooked the fact that in all the experiments the agent, which was used to destroy actual life and its germs, would probably be efficacious in destroying the potentiality of life in non-living matter on the point of assuming life, if any such there were, and, consequently, the positive result having artificially been made impossible, the negative result meant nothing, and should not be allowed to influence opinion. GEORGE HOOKHAM.

Change in Colour of Moss Agates.

THE following observations may perhaps throw light on the colour changes in moss agate and flint noted by Messrs. Whitton and Simmonds in your issues of November 10 and 17. Specimens of the flints from Bournemouth referred to by Mr. Simmonds were brought to this laboratory some months ago, and, though they were not submitted to any very searching examination, it was found that the colouring matter could be removed on boiling a fragment with hydrochloric acid, while the solution gave well marked reactions for iron and phosphoric acid. Now the compound $Fe_3(PO_4)_2.8H_2O$, whether prepared in the laboratory or occurring as the mineral vivianite, is colourless when pure, but becomes oxidised to ferrosoferric orthophosphate, and turns blue, when exposed to the atmosphere. It seems probable, then, that the change of colour of these flints is due to a layer of vivianite which alters on exposure.

In considering the case of the agate penholder, it should be noted that such objects are but rarely made of agate in its natural condition, it being the practice of

the manufacturers to colour the stone artificially by chemical treatment. Thus a fine blue colour can be developed by soaking the stone first in a solution of potassium ferrocyanide and then in a solution of a ferric salt. Now as exposure to the action of alkalies, or in some cases to direct sunlight, suffices to destroy the blue colouring matter, it would seem probable that it is in this direction that an explanation of the change observed by Mr. Whitton is to be sought.

In conclusion, I may add that a very instructive series of specimens illustrative of the artificial colouring of agate is on exhibition in the mineral gallery of the British Museum (Natural History). A. HUTCHINSON.

The Mineralogical Laboratory, Cambridge, November 21.

Eocene Whales.

IN NATURE for September 29 (p. 543) "R. L." reviews Dr. Fraas's paper on the Egyptian zeuglodonts, dissenting from the conclusions that the zeuglodonts are not whales, and that the ancestors of the whales are at present unknown. I trust "R. L." will pardon me for in turn dissenting from these assertions, and for agreeing entirely with Dr. Fraas. So long ago as 1900, in discussing the pelvic girdle of Basilosaurus, I pointed out that the vestigial femur suggested that of a creodont, while later, in *Science* for March 11, I recorded my utter disbelief in any relationship between Basilosaurus and existing whales. Consequently, while greatly pleased at the results of Dr. Fraas's study of the small zeuglodonts, I was not at all surprised. It seems to me that our knowledge of Eocene mammals is really very small, and that it will be many years before we will be able to trace the line of descent of many existing forms with any degree of certainty. This is most emphatically true of the whales, the ancestry of which is still obscure. At the same time I have pointed out (*Science*, March 11) that the Eocene deposits of the southern United States contain remains of a large cetacean that is at present known to us by a few caudals alone. This form is undescribed, because it seemed to me best to await the discovery of better material than caudals. So while the ancestors of whales are still unknown, we have a hint that they may be discovered any day. F. A. LUCAS.

Brooklyn Institute Museum, November 4.

The Discovery of Argon.

IN reference to the slip indicated in the last issue of NATURE by Prof. G. H. Darwin, permit me to mention that the slip was mine—not Mendeléeff's. In Mendeléeff's text it stands: "As to argon and its congeners—helium, neon, krypton and xenon—these simple gases discovered *mainly* (*preimuschestvenno*) by Ramsay. . . ." I am sorry to see that I had omitted the word "mainly."

In reality, my manuscript (which I enclose) contained, as you see, the words "discovered chiefly by Ramsay," but as "chiefly" was not the proper word it was struck out, probably by myself, in the proof. THE TRANSLATOR.

The Leonids, 1904.

WATCHING was begun on November 14, when between 18h. 10m. and 18h. 40m., in a sky rapidly brightening with approaching sunrise, one certain Leonid, of magnitude excelling that of Sirius, shot from Cancer into Gemini.

November 15.—Watch from 12h. 5m. to 12h. 40m., and 14h. 5m. to 15h. 45m. The heavens were very clear at the start. I had just commenced looking out when a beautiful tailed Leonid, of mag. 3, shot from $85\frac{1}{2}°+2\frac{1}{2}°$ to $74°-2°$. At 12h. 17m. thin, broken clouds began to pass over, the sky becoming completely covered at 12h. 40m. At 12h. 38m. a huge-headed Leonid, outrivalling Venus in brilliancy, was seen travelling behind small, broken clouds from $129°+35\frac{1}{2}°$ to $107°+43°$ in three-quarters of a second. The path here given is probably a little too long. About 13h. 30m. the sky began to clear again, and was pretty good by the time of the commencement of the second watch. There were many thin clouds, but the interspaces were large and very clear. At 15h. 25m. the heavens became quite unclouded. In this last look-out Leonids were more numerous, six being between 14h. 45m. and 15h. 38m. The increase in frequency of meteors of the dominant shower at this period was not due to improvement of seeing conditions.

In the latter watch three shooting stars coming from $160°+48\frac{1}{2}°$ were mapped. The radiant point of the Leonids of November 15, as determined from eight tracks, was at $151°+20°$. The meteors were swift, and mostly left streaks. There was a decided tendency towards green in their colouring.

Below are particulars of some of the most interesting Leonids, other than those mentioned above:—

November 15.

G.M.T.	From	To	Mag.	Duration	Length	Remarks
h. m.	° °	° °		secs.	°	
14 46	$181\frac{1}{2}+28$	$186+28\frac{1}{2}$	>1	$\frac{1}{4}$	4	Swift. Greenish-yellow. Directed from 1° N. γ Leonis.
15 6	$71-9\frac{1}{2}$	$64-11$	>1		$7\frac{1}{2}$	Very swift. White, tinged blue.
15 26	$101+16\frac{1}{2}$	$88+12\frac{3}{4}$	<S	1	14	Green-yellow.
15 38	$172+34\frac{1}{2}$	$179\frac{1}{2}+37\frac{3}{4}$	S−1		7	White, tinged green. Streak.

Sheffield, November 24. ALPHONSO KING.

Intelligence in Animals.

HAVING recently seen in NATURE some accounts of the sagacity of cats, I trust that the following facts, for which I can personally vouch, may also be interesting to your readers.

We have a cat, an ordinary tabby, which, when out and anxious to gain admittance into the house, not only lifts the weather-board of either our front or back hall-doors three or four times in succession, thereby causing a loud knock each time, but has also instructed her young kitten to perform the same feat.

Both mother and daughter now regularly knock in this manner in order to be let in. J. E. A. T.

MY room opens by a door to a hall; when our fox-terrier wants to come into my room from the hall he *scratches* at my door. When he finds himself in the hall and wants to go out by another door to the garden or back-hall, he *whines* for me, and, going out, I find him by the door he wants opened. This—my leisure regrets—is of daily occurrence.

F. C. CONSTABLE.

Wick Court, near Bristol, November 27.

PATAGONIA.[1]

THE dispute between the Argentine Republic and Chile with regard to the boundary line of their Patagonian possessions threatened at one time to result in a prolonged and sanguinary struggle. Happily this misfortune was averted by the decision, honourable to both nations, to refer the differences that had arisen to the arbitration of our Sovereign. A British Commission was accordingly appointed to examine the geographical features of the country and judge how far they could be reconciled with the terms of the treaties the interpretation of which was in question. As the head of this commission was chosen Sir Thomas Holdich, who had served his country as boundary commissioner in the wild inaccessible lands that lie to the north and west of our Indian possessions, and this selection was abundantly justified by the tact and skill with which a frontier more than 800 miles in length was traced in such a manner as to accomplish the almost unprecedented feat of satisfying both parties.

In the present volume Sir Thomas Holdich has given us his impressions of the progressive republics of Chile and the Argentine, and of the scene of his

[1] "The Countries of the King's Award." By Sir Thomas Holdich K.C.M.G. Pp. xv+420. (London: Hurst and Blackett, Ltd., 1904. Price 16s. net.